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A Drop to Drink A Report on the Quality of Our Drinking Water

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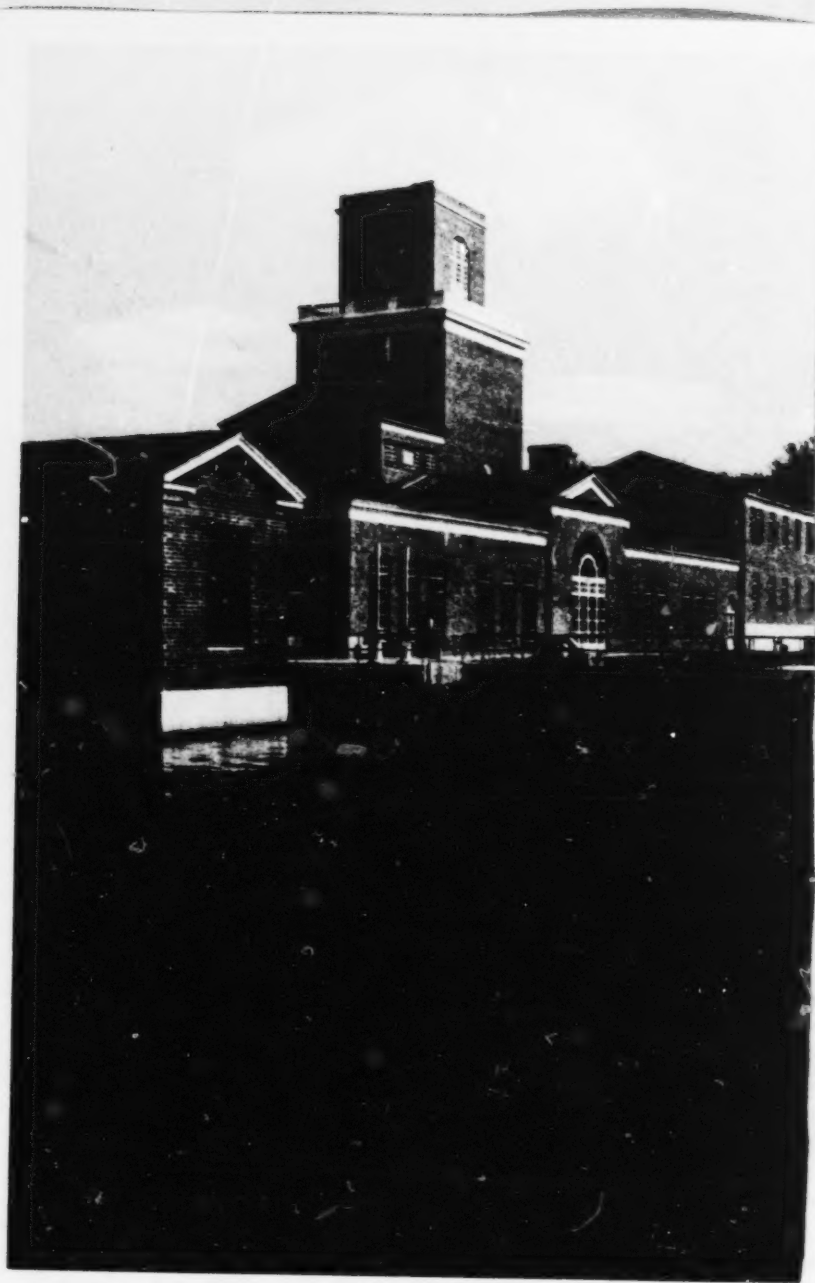
A drop to drink

PB 263 324

A report on the quality
of our drinking water



REPRODUCED BY
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“We in America have long considered safe drinking water as our natural heritage. Indeed we have accepted it much as we have regarded the air we breathe—unlimited, free and clean. But it is neither limitless nor free nor a product that somehow is immune from the pollution which affects other aspects of our lives.”

**Russell E. Train, Administrator
U.S. Environmental Protection Agency**

Revised June 1975

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Introduction

An adult American drinks from one and a half to five or more quarts of water a day depending on climate, workload, body size, and many other factors.

Most of us assume that the water we drink is safe. It usually is, but there are instances where some people are using improperly treated drinking water contaminated by bacteria, toxic chemicals, metals, or other pollutants.

A minimum of 4,000 known cases of waterborne illnesses occurs each year in this country; the actual total may be 10 times greater. Further, medical science has not yet determined the effects on man of long-term, low-level exposure to contaminated drinking water.

Impure drinking water could become a major problem in this decade as the pressures of expanding population, economic growth, and new industrial processes make us turn to new sources of raw water and accelerate water re-use.

To combat this potential threat to our health, Congress passed the Safe Drinking Water Act on December 16, 1974. The Act marks the first time a national commitment has been made to safeguard public drinking water supplies. It provides that the Federal Government—the U.S. Environmental Protection Agency (EPA)—set national standards, and that the States enforce those



standards and otherwise supervise public water supply systems and sources of drinking water.

But the ultimate responsibility for safe drinking water rests on us as citizens. This booklet is designed to help evaluate the state of the Nation's drinking water, and explain how the new Act will help us protect our drinking water supplies.

Is Your Drinking Water Safe?

Based on the 1969-1970 Community Water Supply Study, a field inspection and evaluation of 969 community water supply systems conducted by the Department of Health, Education, and Welfare, estimated that about 8 million people are served impure drinking water from an estimated 5,000 of the Nation's community water systems. The majority of these deficient systems serve smaller communities. In addition, some 20 million people today are without running water and are hauling and consuming water from suspect sources.

Also, another 30 million Americans obtain water from individual sources such as wells and springs, many of which are unprotected against dangerous impurities.

In the period of 1961-1973, there were more than 200 known or reported outbreaks of disease or poisoning caused by contaminated drinking water. Twenty-two people died and an estimated 54,537 became ill, many seriously. Some EPA water supply experts believe perhaps 10 times as many such outbreaks occur, but go unreported for a variety of reasons and that countless individual sufferers—and their doctors—fail to associate ailments with contaminated water.

Illnesses known to be caused by germ-laden drinking water include

infectious hepatitis, salmonellosis, and gastroenteritis.

EPA water supply investigators are concerned about viruses in drinking water because of deficiencies in operation of treatment facilities and distribution of many of our water systems.

New families of pollutants are degrading drinking water. The use of chemical compounds for agricultural, industrial, institutional and domestic purposes has increased sharply in the last several decades. There are thousands of toxic chemical compounds in industrial use today. New chemicals are developed each year and many of these enter and contaminate both surface and groundwater.

Some of the chemicals found in drinking water are known to cause cancer, genetic mutations, or birth deformities, but this does not necessarily mean that scientists have attributed such pathologies to drinking water.

Chemical contaminants such as phosphates (from fertilizers), nitrates, pesticides, detergents, trace amounts of metals, acid from mine drainage, cyanide, phenols, radioactive substances, solvents and halogenated hydrocarbons are relatively new threats to our water sources.

Most conventional treatment processes, originally designed to

produce water from less-polluted sources, are not as effective in the removal of increasing amounts and varieties of chemical contaminants, trace metals and radioactive materials.



A General Review of the Situation

There are between 30,000 and 40,000 municipal water supply systems in this country, and an additional 200,000 water supply systems serving non-residential locations such as gas stations and motels. Many were not designed to cope with present-day raw water quality. These systems were designed, primarily, to remove coliform bacteria from the relatively clean water of earlier days. The principal concerns at that time were typhoid, cholera and dysentery. The first two of these diseases now have been eliminated for the most part in the United States.

Today, new threats to public health are appearing in drinking water while much of the apparatus to meet these threats remains tuned to contamination problems of an earlier era.

Our national water resources are finite, but our demand for water continues to rise steadily. This fact, plus the increasing volume, variety, and complexity of pollutants that enter surface and groundwater, pose problems.

Federal standards for drinking water were first issued in 1914 to prevent the interstate spread of communicable diseases, and were modified and expanded numerous times thereafter. In 1962, the U.S. Public Health Service revised its drinking water standards. The

standards set mandatory limits for health-related chemical and biological impurities, and recommended limits for impurities affecting appearance, taste and odor. Although these standards applied only to water supply systems serving interstate carriers, most States and large cities used them as guidelines to regulate drinking water quality within their jurisdictions. Nevertheless, the 1970 Community Water Supply Study showed—as was noted earlier—that some eight million people were being served potentially dangerous water from an estimated 5,000 community water supply systems.

Principal findings of the study, which evaluated 969 community water supply systems, were:

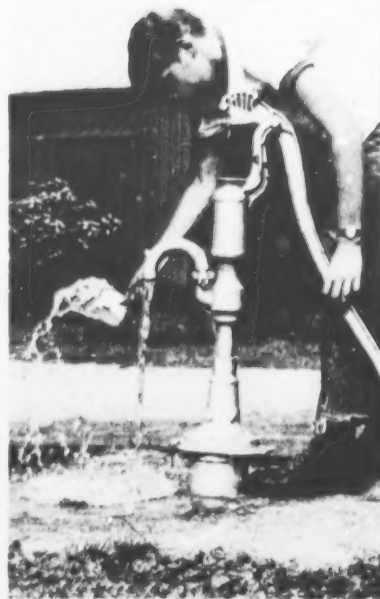
- 36 percent of 2,600 individual tapwater samples contained one or more bacteriological or chemical constituents that exceeded the limits of the 1962 Federal Drinking Water Standards;
- 56 percent of the systems showed facility deficiencies relating to equipment design, construction, or condition of the basic plant;
- 77 percent of the plant operators were inadequately trained in water microbiology, and 46 percent were deficient in chemistry related to their assignment;
- 79 percent of the systems had not been inspected by State or

county authorities in the calendar year preceding the study.

Overall, smaller systems were found to have more deficiencies than larger ones.

These findings have been supported by later U.S. Government studies.

When EPA was established in December 1970, it assumed responsibility for setting and enforcing Federal drinking water regulations, and continued a revision—already in progress—of the 1962 U.S. Public Health Service standards. This revision served as the basis for interim standards developed under the 1974 Safe Drinking Water Act.



The New Legislation

The Safe Drinking Water Act of 1974 was designed to assure an adequate supply of safe drinking water for all Americans served by public water systems.

The Act gives EPA responsibility for setting minimum national drinking water standards for all public water systems throughout the United States having at least 15 service connections or regularly serving at least 25 people. The States play the lead role in enforcing these standards—as well as supervising drinking water sources and public systems. If a State is negligent in administering the law, however, EPA may take legal action. The Agency also may act to prevent or terminate drinking water contamination posing an "imminent" health hazard, if State and local authorities fail to respond.

If public water systems cannot reasonably meet the standards, provision is made for States to grant variances and exemptions.

The drinking water standards set forth in the Act are of two types: primary and secondary. *Primary* standards are aimed at protecting public health with the best water treatment methods generally available, taking cost into consideration. These standards will ultimately include maximum allowable contaminant levels in drinking water, water treatment

techniques, and general criteria for water supply system operation, maintenance, siting and intake water quality. *Secondary* standards are designed to protect public welfare, and apply only to taste, odor and appearance of drinking water. Unlike primary standards, secondary regulations are enforced only if a State elects to do so.

Interim (temporary) primary standards were proposed by EPA in March 1975 and are scheduled to become effective in December 1976. During this time, the National Academy of Sciences will conduct a study on the health effects of drinking water contamination. The results will form the basis of revised primary standards—scheduled to be proposed in 1977 and to become effective in 1979.

If a public water supply system fails to comply with these primary standards (or fails to meet a compliance schedule), it must give notice of this failure to both its customers and news media.

The Act also sets up a regulatory program to protect underground sources of drinking water. Under the program, designated States are required to establish and enforce underground injection control regulations. Regulations cannot, however, interfere with oil or natural gas production, unless such regulations are essential to

prevent danger to underground water sources.

Other highlights of the Act:

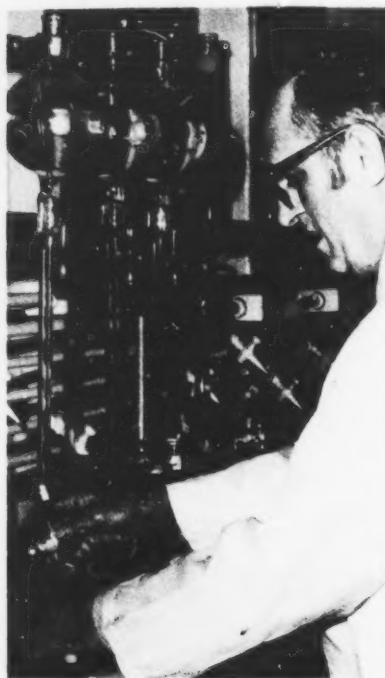
- EPA is authorized to conduct research on technological and health aspects of providing public drinking water. Special studies required by Congress include a rural water survey, and research into the contamination of drinking water by waste disposal, viruses, and cancer-causing chemicals. Work in these and other research areas was already underway at EPA before the legislation was passed.

- EPA is also authorized to help States improve their drinking water programs by providing technical assistance, employee training and financial support. The Agency can also guarantee loans to small water supply systems that cannot reasonably find the financing necessary to meet the regulations.

- Provision is made for assuring adequate supplies of treatment chemicals for public water supply systems.

- A citizen may bring civil action against any public water system or Federal agency (including EPA) that he believes is violating the Act.

- A 15-member National Drinking Water Advisory Council is established to advise EPA on



proper implementation of the legislation. The general public, State and local agencies, and interested private organizations are represented on the Council.

- The Department of Health, Education, and Welfare, which oversees the safety of bottled drinking water, is required to make such water conform to the primary standards set under the Act, or publish reasons for not doing so.

- To help EPA implement the legislation, Congress has authorized \$156 million for fiscal years 1975, 1976, and 1977.

Research

Water supply research is essential to provide the scientific information necessary to support all levels of government in working for safe and esthetically acceptable drinking-water supplies.

EPA research, for example, is developing techniques to make possible monitoring of viruses in drinking water. The association of viruses with hepatitis and other diseases is well known, but viruses have been difficult to locate.

EPA is investigating the degree to which minimum chlorination and other types of disinfection of drinking water eliminate viruses along with bacteria. Viruses are not removed from water supplies unless modern treatment systems are operating properly. Much more research is needed on this potentially critical problem. Work also is required to develop effective methods to protect our water supplies from new toxic chemicals and from radioactive wastes.

EPA's water supply research is primarily directed to:

- Epidemiological investigations of water borne diseases and toxicities to determine relationships between drinking water quality and disease.
- Development and application of sensitive methods for isolating and identifying disease-producing organisms present in drinking water at the faucet. The results

of this research will contribute to the improvement of water supply treatment methods, to the formulation of bacterial criteria for drinking water, and to the determination of the quality of water reaching the public.

- Development and application of procedures for recovery and identification of potentially harmful organisms and chemicals in drinking water.
- Development and evaluation of improved water treatment processes. Conventional water treatment procedures do not remove some chemicals that may be found in drinking water sources.
- Determination of the acute and long-range chronic effects on man of organic and inorganic chemicals that may be found in drinking water. Many of the thousands of different toxic chemicals in industrial use today find their way into water supplies. These studies seek to determine safe tolerance limits of these chemicals in drinking water.
- Development of simple, rapid methods for detection and measurement of bacteria, chemicals and toxic agents in water to permit rapid routine monitoring of drinking water supplies.

The Safe Drinking Water Act will provide much of the financial support necessary to maintain EPA's initiative and standards of quality in these and other drinking water supply research activities.

Treatment

The quality of source waters, generally, will determine the treatment processes required to produce safe, acceptable drinking water.

All surface waters are subject to temporary deterioration in quality through increased levels of turbidity, algae growths, and miscellaneous contaminants. To be on the safe side all surface waters should receive a degree of treatment more extensive than disinfection. This treatment could include flocculation (a process of aggregating solids), sedimentation, or filtration, or some combination of these conventional procedures.

If waters are too contaminated for treatment by conventional processes, they will require additional treatment. Even though conventional treatment is provided, great care should be taken to prevent and control contamination of the raw-water source.

Disinfection should be the minimum recommended treatment for groundwater used in public water supply systems. Over the years, drinking water from protected wells has been served to customers without any treatment. However, contamination of distribution systems together with related outbreaks of disease have demonstrated the need for maintaining residual levels of a

disinfectant throughout public systems.

Groundwater exists in a saturated zone of the earth's crust. Individual homes use ground supplies from springs and wells; these serve some 30 million Americans. In addition, about 80 million people are served by community systems that draw upon groundwater. Water from deep wells is usually of acceptable bacteriological quality but variations due to geology make generalizations unreliable. It has been reported that infectious hepatitis and typhoid fever are problems arising from contaminated shallow wells in some areas. Such pollution may be caused by seepage of contaminated surface waters.

Samples of drinking water from underground wells on farms should be taken periodically during the year and analyzed for bacteriological, physical, and chemical characteristics.

Many species of bacteria are capable of establishing cultures in unclean or corroded pipes. Samples of water for analysis should be taken at the customer's faucet as well as at the source to determine the presence of any microbial buildup in piping systems.



What About the Future?

The Federal Water Pollution Control Act of 1972 proclaims two general goals for the United States:

- Wherever possible by July 1, 1983, water that is clean enough for swimming and other recreational use, and clean enough for the protection and propagation of fish, shellfish, and wildlife.
- And then, by 1985, no more discharges whatsoever of pollutants into the Nation's waters.

This is a strong commitment to end water pollution to the greatest degree possible, and the Act itself establishes the machinery and financial support required to accomplish this end.

Obviously, improvement of raw water sources will make it easier for public water systems to meet the standards required by the Safe Drinking Water Act, thus reducing the risk to public health. However, surface water will still require treatment before it is introduced to water supply systems. It still will have to go through coagulation, sedimentation, filtration, taste and odor control, and disinfection because of the possibility of human error and the introduction of contaminants. The water supply treatment plant is the last barrier between the consumer and impure water.

It is essential that we broaden the development of wastewater

reclamation, reuse, recycling, and recharging as a major element in water resource management. However, reclamation systems must be designed and operated to avoid health hazards and damage to the environment.

An estimated 50 percent of the Nation is served by drinking water from surface sources that receive industrial waste, untreated sewage, urban runoff, and effluent from sewage treatment plants. Health officials have relied on storage and treatment of the waste water to protect the public against infectious diseases and toxic substances.

Direct reuse—waste water to treatment plant to kitchen tap—requires careful research and investigation. A direct interconnection could present health problems caused by viruses or bacterial or chemical buildup. The direct introduction of chemicals from a waste stream and their buildup through a recycling system could present increased long-term health hazards. Accidental spills or sabotage could present an acute threat in a closed system, as does the questionable reliability of wastewater treatment plant operation. Safeguards must be provided to prevent the introduction of untreated or inadequately treated wastes into drinking water supplies.

Some system of stream storage, or



holding and dilution reservoirs may be required between the reclamation plant and the potable water intake. Biological and chemical monitoring of storage waters would be essential.

Desalination of waters could supply many areas of the country with new drinking water sources. Although desalination is now used in many parts of the world, it is relatively expensive and considered by many to be uneconomical; however, research continues to bring the costs down.

An Informed Citizenry

Citizen action could assure safe drinking water and avert a possible national health crisis in the future. But first, people must stop taking the purity of their own drinking water for granted.

As a citizen, you should express to local, State and Federal officials your feelings of concern about having drinking water that is safe and palatable.

You should familiarize yourself with your local drinking water problems, the adequacy of future supplies, treatment and testing processes, standards of purity, and directions of current research.

You should come to recognize that the protection and safety of a public water supply system depend upon the sanitary environment, quality, and quantity of source waters, the effectiveness and reliability of treatment processes, the integrity and capacity of storage and distribution systems, the quality-control surveillance, and the qualifications and effectiveness of the operating personnel.

As mentioned earlier, the new Safe Drinking Water legislation allows any citizen to sue anyone he feels is violating the Act. This same law also allows the citizen, when a public water system is violating the Act, to petition for and participate in a public hearing aimed at bringing the utility into compliance. A public hearing

must also be held before any public water system is granted a variance or exemption from the requirements of the Act.

An informed citizenry, willing to exert a full measure of power, can demand and get safe water supplies.

Can You Be Active?

Familiarize yourself with the Safe Drinking Water Act, and EPA, State and local regulations governing drinking water. Then find out how your water measures up to these laws. Are steps taken to kill bacteria, to destroy bad tastes or odors, to remove chemical and physical impurities? Check the procedures used by your water supplier.

Examine testing records. Is your supplier testing as frequently as regulations require? Is the water tested for all contaminants cited in the law?

If you are dependent upon individual water supplies, check if samples from these sources are routinely tested by your local or county health department.

Finally, make your concern about having drinking water that is chemically and biologically safe and palatable a matter of record with appropriate local, State and Federal officials.